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ABSTRACT

The purpose of this study was to determine whether motor activity, previously assumed necessary to induce visual imagery in young children's associative learning, actually has to be executed in order for children to generate images. The results of an experiment with 96 kindergartners clearly suggest not: in conditions where subjects simply planned and activity (without executing it) learning was enhanced. Further, the temporal proximity of the planning to the potential motor activity did not prove to be important. These results, combined with those from subsequent experiments, give rise to the speculation--among others--that young children can be "tricked" into imagery generation through appropriately worded instructions. (Author/JMB)

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WISCONSIN RESEARCH
AND DEVELOPMENT
CENTER FOR
COGNITIVE LEARNING

Technical Report No. 358

IMAGERY GENERATION AND MOTOR ACTIVITY IN YOUNG CHILDREN: TRICK OR FEAT?

by

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Report from the Project on
Children's Learning and Development

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ABSTRACT

The purpose of this study was to determine whether motor activity, previously assumed necessary to induce imagery in young children's associative learning, actually has to be executed. The results of our experiment with kindergartners clearly suggest not: In conditions where subjects simply planned an activity (without executing it) learning was enhanced. Further, the temporal proximity of the planning to the potential motor activity did not prove to be important. These results, combined with those from subsequent experiments, give rise to the speculation--among others--that young children can be "tricked" into imagery generation through appropriately worded instructions.

I

INTRODUCTION

In recent years investigators have been charting the developmental course of visual imagery as a facilitative associative-learning strategy. Wolff and Levin (1972), for example, found that third graders could benefit from instructions to generate images of pairs of toys interacting, whereas the learning of kindergartners remained unchanged. However, although children below the age of seven or eight do not benefit from simple imagery instructions, there are conditions under which they seemingly can generate images. Discovering that the learning of kindergarten children increased substantially when they were allowed to play with the toys (even though the activity itself was screened from view), Wolff and Levin inferred that the imagery of the young child originates in his motoric interactions with the environment (consistent with the Piagetian belief). Further, Varley, Levin, Severson, and Wolff (1974) were able to train kindergartners to generate images without concurrent motor activity by first allowing them to practice playing with or drawing pictures of pairs of toys. Other experiments in imagery training have yielded similar results (Danner & Taylor, 1973; Yuille & Catchpole, 1973).

While these findings shed new light on the process of "inducing" imagery in young children, the exact relationship between imagery and motor activity remains unclear. Varley et al. (1974) noted that a number of subjects hesitated before playing with the pairs of toys and suggested that these children were thinking up interactions before they executed the motor activity, even though they were not explicitly instructed to do so. That is, young children may actually be generating an image during the planning of the activity, rather than during the execution of it. If this is the case, then a child who is instructed simply to plan for a forthcoming activity may be able to generate a facilitative image, even when no motor activity and no prior motor training are supplied.

The purpose of the present study was to determine whether the young child can be induced to generate imagery (which subsequently facilitates learning) as he is planning for an activity which he believes he is about to perform, and, in so doing, to determine the importance of the temporal proximity of the planning of an activity to its execution. In other words, can a young child be "tricked" into generating an image by simply having him plan for an activity (but not actually perform it)? And if so, does the success of the trick depend on the child's perceived immediacy of the expected activity? Or rather can the child plan for an activity which is clearly not immediately forthcoming (in which case the planning and the execution do not occur jointly as a single continuous event--cf., Wolff, 1972)?

II

METHOD

SUBJECTS

Ninety-six kindergarten children from two elementary schools in the Midwest served as subjects. The children ranged in age from 4 years, 8 months to 5 years, 8 months. Subjects were randomly assigned in equal numbers to one of four conditions (resulting in 24 subjects per condition) and tested individually in a small room.

DESIGN AND MATERIALS

The objects used for the paired-associate learning task were 24 small, common children's toys (e.g., a plastic car, fish, hammer, cup, monkey). The 24 toys were combined to form 12 pairs. Toys were paired together such that interactions were plausible but not exceedingly obvious. Two additional pairs of toys were used for practice before the 12 test pairs were presented.

The subjects were given instructions to observe and/or manipulate the pairs, according to the condition to which they were assigned, under an incidental-learning format. In the Motor Stop condition, the subject held his hands above each pair of toys after having been told that he would play a game in which he would receive either a go or a stop command to indicate whether he should or should not immediately play with the toys. If the experimenter said go, the subject was to engage the toys in a meaningful interaction; whereas if the experimenter said stop, the subject was to keep his hands motionless. Since the subject did not know in advance the specific pairs for which he would be given the go instruction, it was assumed that he was planning an activity for every pair. In the Motor Plan condition, however, the play activity was not represented as immediately forthcoming. Rather, before each pair was introduced, the child was instructed that he would either have to play with the toys (corresponding to the go pairs in the previous condition) or to plan an activity that he would be asked to perform "in a little while" (stop pairs). In both conditions, subjects actually played with only half the pairs, with the "manipulate" and "nonmanipulate" pairs interspersed randomly throughout the study list (counterbalanced across subjects). In the last two conditions, no motor manipulations of the toys occurred. Plan subjects were told that they would be asked to make each pair of toys play together "in a little while" (to determine whether the interspersed activity of the Motor Plan condition

constitued some type of "training" à la Varley et al., 1974). Imagery Control subjects were given straight imagery instructions, approximating those used in earlier studies (e.g., Wolff & Levin, 1972); no reference to potential motor activities was made.

PROCEDURE

In each condition, the 2 practice pairs were presented first. The 12 study pairs were presented one at a time for approximately seven seconds each. After all the pairs were presented, the subject was tested by the recognition method. One toy from each pair was arrayed on the table in front of the subject, who was shown the remaining toys one at a time and asked to point to the one that went with it.

III

RESULTS

Of primary concern was the number of nonmanipulate pairs correctly recognized during the incidental-learning test trial. In the two conditions where no toys were manipulated, only the six pairs that were designated "nonmanipulate" in the other two conditions were examined (following a random assignment of subjects to the counterbalanced orders). Employing Dunn pairwise one-tailed comparisons with a familywise α of .05 (see Kirk, 1968), we found that mean performances in the Motor Stop ($\bar{X}$ = 3.88, SD = 1.68), Motor Plan ($\bar{X}$ = 4.25, SD = 1.54), and Plan ($\bar{X}$ = 3.92, SD = 1.82) conditions were all equivalent and each superior to that in the Imagery Control condition ($\bar{X}$ = 2.04, SD = 1.49).

Differences between activity and nonactivity pairs were analyzed within each condition using correlated *t* tests (α .05, one-tailed, for each). Significant differences were found within the Motor Stop group, as well as within the Motor Plan group. No differences were found, however, under the Plan and Imagery Control conditions, where the designation of manipulate and nonmanipulate pairs was purely artificial.

Assurances that the manipulation of half the pairs in the Motor Stop and Motor Plan conditions did not result in a "training effect" (which improved learning on nonmanipulate pairs) come from two sources. First, no differences were found between learning scores for nonmanipulate pairs coming from the first and last halves of the study list. Second, as mentioned previously, learning was the same for nonmanipulate pairs in the Motor Plan condition (where half the pairs were manipulated) and the Plan condition (where no pairs were manipulated).

IV

DISCUSSION

Without manipulating the object pairs, subjects in all three experimental conditions increased their paired-associate learning relative to the Imagery Control group. Inferring that learning here occurs because the subject has successfully generated an image of the toys interacting, we conclude that young children can generate an image in the planning which precedes a motor activity. Furthermore, it can be seen that the induction of imagery through a planning strategy is not contingent upon the perceived immediacy of the anticipated activity. Learning was facilitated both when the subject was planning for an immediate (Motor Stop) and a delayed (Motor Plan and Plan) activity. Thus, the planning strategy appears to be a vehicle through which young children can employ visual imagery without the necessity of a close temporal relationship to the planned activity, without prior training with motor manipulations and, certainly, without the occurrence of the activity itself. It might be inferred that the subject was not knowingly producing an image, but rather that he was "tricked" into generating an image by adopting a planning strategy.

Significant differences between manipulate and nonmanipulate learning scores reveal that, while subjects were able to utilize a planning strategy successfully, it was not as facilitative as when the subjects actually engaged in the manipulation of object pairs. In accounting for these differences, however, one should remember that with "manipulate" pairs subjects were benefiting not only from manipulation of the pairs, but also from the visual feedback provided by the scene of the interacting pairs (Wolff, Levin, & Longobardi, 1972). Had subjects in the present study manipulated the toys in the absence of visual feedback, the performance differences associated with manipulate and nonmanipulate pairs likely would have been reduced, or even eliminated.

The absence of differences between nonmanipulate pairs appearing on the first and last halves of the study list weakens the possibility that the intermittent manipulation of pairs appearing early in the list assisted subjects in generating images for the nonmanipulate pairs appearing later in the list. Further, the lack of difference between the learning of nonmanipulate pairs in the Motor Plan and Plan conditions--no pairs were manipulated in the latter--provides additional evidence in support of the absence of a "training effect."

Two small-scale experiments conducted subsequently add to these results. In one, subjects in a hypothetical Plan condition (where they were told to think of how they could play with the toys--without any suggestion that they would later be expected to do so) performed no

better than Imagery Control subjects. In the second, when subjects in an Imagery condition were told that later "we will see what your pictures look like"--without any explicit mention of play--their performance surpassed that of subjects in an intentional-learning control condition. These results suggest that tricking young children into using imagery is not dependent upon their planning specifically for a motor activity, but rather is a function of the child's expectation that he will somehow have to exhibit his product to the experimenter. Must each of these expectations necessarily involve the generation of a visual image on the child's part (rather than, for example, a purely verbal plan)? And do previous notions of the close relationship between motor activity and visual imagery generation need to be modified somewhat? We await additional research to uncloud this picture.

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